PROCEDURE OF THE EFFICIENCY VERIFICATION OF THE SLUDGE BED AFTER URANIUM ORE MILL REDEVELOPMENT

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Positive approach of the public as well as the government to old waste disposal issues results in redevelopment of the sludge beds. However the very high concentration of natural radioactive isotopes, collected in the old sludge beds from uranium ore mill, could be the source of the population irradiation. The main hazards are:

- the increase of the effective dose from internal and also external gamma radiation;
- the increase of the effective dose from inhalation of radon;
- infiltration of the radionuclides into the underground water.

The sludge beds are usually redevelopment by overlaying one or more layers of inert material. The efficiency of this procedure, leads to decrease of the irradiation, it can be controlled using in situ or laboratory gamma spectrometry method. This method makes it possible to determine dose rates or K, U, Th concentration on the surface of the sludge bed. In the uranium and thorium decay chains can be assumed radioactive equilibrium disturbance.
For verification during redevelopment in one of the sludge beds in the Czech Republic, the following measurements were carried out:

- in situ gamma spectrometry using scintillation detector NaI(Tl) 3"x3" in two geometry of measurement, with recording of point location using GPS device: 1 meter above the surface (gamma dose rates results) and at the surface (the results of those measurement were gamma dose rates and K, U and Th concentrations);
- in situ gamma dose rate measurement using plastic detector;
- laboratory gamma spectrometry measurement of twenty samples from 4 short depth vertical profiles, using HPGe detector in geometry with Marinelli containers;
- radon in soil gas sampling from 4 shallow depth vertical profiles measurements, using “lost tip” method and small Lucas cells.

In total XX points along four parallel and two crossing profiles above and at sludge bed surface were measured. In four points there, (two locations in the original sludge bed material with very high radioactivity and two locations in the inert overlaying material with very low radioactivity) were hollowed vertical depth profiles. In those profiles were measured gamma dose rates, concentration of K, U, Th and radon concentration in soil gas (in parallel depth profile) with the steps of twenty centimeters to the depth of 80 centimeters. The samples (in total 20) for laboratory gamma spectrometry measurement, with the comparable step were taken as well. Some difficulties were noticed during the radon measurement in the depth profiles, caused by presence of low level underground water and in the course of gamma spectrometry measurement due to high death time (40% - 50%). The results from in situ gamma spectrometry measurement were processed into maps of dose rate and compared with redevelopment works on the sludge bed. Our results confirm very high reliability (effectiveness) of the applied inert material and remediation method.